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Advanced Biofuel from Bio-grease

Using its proven patented technology, ECO shipped over 24,000 tonnes of hydro-treated vegetable oil to Europe.

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New Energy and Diversified Businesses



Advanced Biofuel from Agricultural Waste

In a trial of ECO's first biomass utilisation project in Tangshan, Hebei province, we are getting ready to test our technology for producing cellulosic ethanol, an advanced biofuel made from agricultural waste.



Clean Coal Chemical Project

At ECO's plant in Inner Mongolia Autonomous Region, we are producing ethylene glycol, a premium chemical converted from syngas.

New Energy and Diversified Businesses

The core strategy of our new energy business is to turn low value feedstock into high value products through innovative technology. With a portfolio of proprietary technologies that continues to grow, we are making greater contributions to environmental protection.

ECO: A Leader in Green Energy

Established in 2000 in Hong Kong, ECO Environmental Investments Limited (ECO) is our business platform for developing new forms of clean energy, advanced chemicals and new material products from waste feedstock. Our objective with ECO is to become a global leader in the green industry, providing solutions that address the environmental challenges associated with climate change.

Innovation that drives value creation is the cornerstone of ECO's business. In pursuit of this strategy, we have established research and development facilities in Shanghai and Jiangsu province. At these two facilities,



our researchers develop products derived from biomass-based and recycled carbon-based materials, with a focus on advanced biofuels and eco-friendly materials.

From LNG to Advanced Biofuels

ECO's plant in Shanxi province is now in its 11th year of operation. This is where we convert coalbed methane extracted from neighbouring coal mines into liquefied natural gas (LNG).

Following a successful trial, the ECO plant in Zhangjiagang has begun ramping up the production of hydro-treated vegetable oil (HVO).

Since coalbed methane is a potent greenhouse gas (GHG) if released into the atmosphere, this plant has addressed the issues of both climate change and excessive consumption of fossil fuels by not only producing clean-burning LNG but also reducing GHG emissions.

ECO utilises agricultural waste and converts it into high value products.

Using its own patented technologies, ECO produces hydro-treated vegetable oil (HVO) that helps to meet the EU's latest renewable energy targets under Renewable Energy Directive (RED) II and its commitment to reducing emissions under the Paris Agreement.

In 2019, after modification works to overcome a number of technical challenges, the ECO plant at Zhangjiagang, Jiangsu province started stepping up its daily production rate of HVO. Six shipments were delivered to Europe during the year, totalling more than 24,000 tonnes of HVO.

Also in 2019, ECO commenced construction of the second phase of this project, which will bring HVO production capacity to 250,000 tonnes per year. It is expected to be commissioned in mid-2020.

In addition to expanding its HVO plant in Zhangjiagang, ECO is exploring other possible sites for a new HVO plant in Southeast Asia.

ECO sees tremendous growth potential for this business, particularly with concerns over the



possible threat to food security associated with existing biofuels that are mostly derived from food stock and feed. Instead, ECO utilises palm oil mill effluent and used cooking oil, both of which are considered waste residue, to produce HVO. After certification under the International Sustainability and Carbon Certification Scheme, the HVO produced by the plant is recognised as an advanced biofuel.

ECO has successfully developed an innovative technology for decomposing agricultural waste into its three basic components – cellulose, hemicellulose and lignin. The decomposed cellulose can be further processed into cellulosic ethanol, another advanced biofuel as defined under the RED II framework. The feedstock for our biomass project will mostly comprise agricultural waste such as corn cobs and straw. Previously, there was no effective solution for handling this type of waste. Although some waste would be

returned to fields or used to generate power, this was only done in small quantities. By utilising this waste to produce advanced biofuels and high value chemical products, ECO is making the concept of turning waste into treasure a reality.

In 2019, construction proceeded on an agricultural waste utilisation plant in Tangshan, Hebei province as a pilot project for producing paper pulp and furfural and for testing ECO's proprietary hydrolysis technology. Trial production at this plant will begin in the first half of 2020.

Construction of a second plant in Cangzhou, Hebei province was also under way. Once in operation, it will be one of the very few plants of its kind in the world, producing not only cellulosic ethanol as an advanced biofuel, but also furfural as a green building block chemical. This plant is scheduled for completion by the end of 2020.

From Fuels to High Value Chemicals

At our plant in Ordos, Inner Mongolia Autonomous Region, ECO is producing both methanol and, since 2018, ethylene glycol as part of its clean coal chemical project. In addition, there are other opportunities for producing high value chemical products from coal while also minimising carbon emissions. One such opportunity is the production of dimethyl carbonate, which synthesises methanol with carbon monoxide in a more advanced carbonylation process.

With the continuing development of new technologies at ECO, we are confident that substantial

improvements can be made to the traditional coal chemical utilisation technologies to provide much greater environmental benefits.

Business in Hong Kong

The past year was one of the most challenging for Hong Kong, due to the impact of the ongoing China-US trade disputes and social unrest throughout the latter half of 2019. Nevertheless, our aviation fuel and LPG filling station businesses continued to record stable performance during the year.

Our aviation fuel facility, which is under a 40-year franchise agreement with the Airport Authority Hong Kong, supplies

fuel for aircraft at Hong Kong International Airport in Chek Lap Kok. This business operates eight tanks with a gross aviation fuel storage capacity of 264,000 cubic metres as well as a jetty with two berths for receiving fuel from Tuen Mun and delivering it to the Airport via two undersea pipelines. Now a major logistics base for aviation fuel in Hong Kong, it supplies approximately 6 million tonnes of fuel a year and remains one of the greatest profit generators for the Company.

Our five dedicated filling stations serve around 18,000 LPG taxis and most of the LPG minibuses in Hong Kong, 24 hours a day. These stations typically sell around 65,000 tonnes of LPG a year, accounting for about 30 per cent of Hong Kong's auto LPG market.

We also manage landfill gas projects in Hong Kong, using gas collected from strategic landfills in the North East New Territories and South East New Territories. In addition to reducing GHG emissions at the two sites, the treated landfill gas has contributed to the renewable portion of the Group's energy mix.





TGT provides a reliable bespoke cloud computing service at its world-class data centres in Hong Kong and mainland China.

Telecommunications

We operate telecommunications businesses both in Hong Kong and mainland China through Towngas Telecommunications Company Limited, a wholly-owned subsidiary of the Group, and its subsidiaries (collectively known as TGT). With its solid infrastructure and resources, TGT provides services to Hong Kong, mainland China and international telecommunications providers, operators, and enterprises.

The year 2019 marked TGT's 15th anniversary since its start as a small local data centre. Today, it has grown into a company with seven world-class data centres providing up to 16,000 server racks, strong connectivity and advanced data services such as fog and cloud computing.

Another competitive advantage of the Company in Hong Kong is TGT's Glass-in-Gas technology, which allows us to install optical fibres within our extensive gas pipe network for a more cost-effective, interference-free alternative to traditional road opening methods. This technology is now also being applied in mainland China, where our Technical Standards for Laying Fibre Casing Pipe in Gas Pipeline obtained the approval from the China Gas Association.

During the year, an associate company of TGT, Shenzhen Internet Exchange Co., Ltd., received several valued-added telecommunications service licenses in Shenzhen to provide services related to the Internet and data centre businesses in the city. TGT also formed a new joint venture company with its strategic partner

in Beijing. The synergy effect of this partnership enables TGT to integrate its existing resources and accelerate the deployment of its connectivity business while also broadening its interests.

Moreover, TGT plans to set up a local sales team in Taiwan, aiming to establish a presence in this market in order to serve existing customers better, including telecommunications and cloud service providers in Taiwan.

During the year, TGT received the Innovative Data Centre – Gold Award from the Communications Association of Hong Kong (CAHK) at the 2019 CAHK STAR Awards and the Top Third Party Data Centre Award at the 14th China IDC Industry Annual Ceremony.

In future, TGT operations will continue to grow through the pursuit of new business opportunities in Hong Kong, mainland China and overseas as well as the introduction of innovative new technologies such as 5G to the market.

Information Technology

Our wholly-owned subsidiary, S-Tech Technology Holdings Limited (S-Tech), was established to provide our city-gas companies with information technology that supports customer service management.

Today, this business is engaged in cloud software development, solutions implementation and systems integration services that enable our city-gas businesses to manage their advanced customer service and gas piping network systems.

In 2019, S-Tech's online customer service management platform, Towngas Customer Information System (TCIS), covered 85 per cent of the Group's city-gas companies on the mainland. Among these companies, 85 per cent are now using the latest cloud version to reduce operational costs and provide superior service to more than 16 million end customers.

Also during the year, S-Tech cooperated with Shandong Jihua Gas Co., Ltd in Jinan, one of our

major city-gas joint ventures in Shandong province, to introduce a new IT solution, Towngas Total Solution (TTS+). TTS+ is a comprehensive information system that seamlessly integrates Towngas' financial, engineering and purchasing systems with S-Tech's software, including TCIS 3.0, the Virtual Customer Centre (VCC) e-commerce platform, as well as the Towngas Management System and Geographic Information System. All these are relevant and useful IT systems for running gas companies' operations and enhancing customer service levels and productivity. Through this highly integrated TTS+ information system, gas companies can enjoy more flexible interconnections and optimised resources. This total solution was successfully launched in September.

Civil and Building Services Engineering

U-Tech Engineering Company Limited (U-Tech) is a wholly-owned subsidiary of the Group providing consultancy and

engineering contractor services in Hong Kong and Macao. These services include utilities installation, infrastructure construction and civil and building services engineering for public and private projects.

During the year, U-Tech acquired a district cooling mains construction contract from the Electrical and Mechanical Services Department at the Kai Tak development area. Other contracts secured in 2019 include U-Tech's second contract with Evergrande Group for MVAC installation works at their residential development in Cheung Sha Wan, as well as a new contract for the supply and installation of electrical works for Henderson Land's residential development at Kai Tak.

U-Tech's high quality services and safety standards are well recognised in the industry. In 2019, the Company received the Safety Performance Award – Construction from the Occupational Safety and Health Council for the sixth consecutive year.

Manufacturing

M-Tech Metering Solutions Company Limited (M-Tech) is a wholly-owned subsidiary of the Group that develops and markets smart gas meters. These smart commercial and residential meters, which are based on the latest technology, help to satisfy the demand for mobile payments, data management and accurate gas consumption measurement.

In late 2019, M-Tech collaborated with a well-known manufacturer of gas meters in mainland China to launch an advanced residential Narrowband Internet of Things (NB-IoT) smart meter, which replaces conventional IC card meters. This new meter works seamlessly with the Group's two

major IT systems – TCIS and VCC – and is designed to ensure greater data security. It also enables gas companies to perform gas consumption analysis to identify peak-shaving distribution with daily data updates, while providing end-users with the latest smart metering functions, such as mobile payments and gas leakage safety alerts.

As this smart meter is already widely accepted in the mainland residential market, M-Tech has plans to develop a similar meter equipped with NB-IoT modules for the commercial market.

Another wholly-owned subsidiary of the Group, G-Tech Piping System (Zhongshan) Company Limited (G-Tech), supplies high

quality polyethylene (PE) piping, fittings and related ancillary products. With the support of GH-Fusion Corporation Limited (GH-Fusion), a joint venture between Towngas and Fusion Group founded in the United Kingdom, specialising in PE fittings, G-Tech can provide clients with a comprehensive range of products for piping systems.

G-Tech operates eight piping extrusion lines in both its Zhongshan and Maanshan production plants. During the year, G-Tech set up a new distribution centre in Qingdao, Shandong province, thus substantially reducing the logistics costs and time for clients in the northern region. G-Tech now plans to set up more distribution centres in order to satisfy business development needs.

GH-Fusion also continued to explore new business opportunities in overseas markets, including Europe and Asia Pacific.



These automated facilities at G-Tech's manufacturing plant help to increase productivity and efficiency.